CLAIMS

[1] An engine valve operating system, comprising:

a rocker arm (63, 63A, 63B) which has a cam-abutting portion (65) to abut a valve operating cam (69) and whose first end is coupled in operative association with an engine valve (19);

a link mechanism (50, 50A, 50B) equipped with a first link arm (61) which has a first connecting portion (61a) at a first end to be turnably connected to the rocker arm (63, 63A, 63B) and has a fixed support portion (61b) at the second end to be turnably supported at a fixed position on an engine body (10) as well as with a second link arm (62, 62A, 62B) which has a second connecting portion (62a, 62Aa, 62Ba) at a first end to be turnably connected to the rocker arm (63, 63A, 63B) and has a movable support portion (62b, 62Ab, 62Bb) at the second end to be turnably supported by a movable shaft (68a) which is displaceable; and

drive means (72) connected to the movable shaft (68a), being capable of displacing the movable shaft (68a) in order to vary a lift amount of the engine valve (19) continuously,

characterized in that the first and second connecting portions (61a, 62a) are arranged in parallel and relatively turnably connected to the second end of the rocker arm (63, 63A, 63B) and the movable support portion (62b, 62Ab, 62Bb) of the second link arm (62, 62A, 62B) is placed nearer to the engine valve (19) than the fixed support portion (61b) of the first link arm (61).

[2] The engine valve operating system according to claim 1, wherein a housing portion (60) capable of housing the movable support portion (62b, 62Ab, 62Bb) is formed in the first link arm (61) in such a way that a straight line (L2) linking the first connecting portions (61a) of the first link arm (61) with the flank of the fixed support portion (61b) on the side of the second link arm (62, 62A, 62B) overlap with part of the movable support portion (62b) as viewed laterally when at least the movable support portion (62b, 62Ab, 62Bb) is placed at the closest point to the first link arm (61).

[3] The engine valve operating system according to claim 2, wherein the first link arm (61) is formed into a U shape with a pair of first connecting portions (61a) which sandwiches the rocker arm (63, 63A, 63B) from both sides, the fixed support portion (61b), and a pair of arm portions (61c) which link the first connecting portions (61a) and the fixed support portion (61b); and at least part of the housing portion (60) is formed between the two arm portions (61c).

[4] The engine valve operating system according to claim 2 or 3, wherein the housing portion (60) can house at least part of the movable shaft (68a).

[5] The engine valve operating system according to claim 1, wherein the rocker arm (63) is equipped at the first end with a pair of bolt mounting portions (63a) into which adjustment bolts (70) are screwed, the adjustment bolts (70) having adjustable advance/retract positions and abutting a pair of engine valves (19), respectively; and on the rocker arm (63),

a rib (63b) is installed between the bolt mounting portions (63a) and sticks out from the first end of the rocker arm (63) to the cam-abutting portion (65).

[6] The engine valve operating system according to claim 5, wherein the first link arm (61) is formed into a U shape with a pair of first connecting portions (61a) which sandwiches the rocker arm (63) from the opposite sides, the fixed support portion (61b) turnably supported at a fixed position on the engine body (10), and a pair of arm portions (61c) which link the connecting portions (61a) and the fixed support portion (61b); and the second link arm (62) is formed into a flat shape so as to be placed between the two arm portions (61c) as viewed orthgonally to a straight line (L1) which links rotational axes at opposite ends of the first link arm (61).

[7] The engine valve operating system according to claim 5 or 6, wherein the first end of the first link arm (61) is turnably connected to the rocker arm (63, 63A, 63B) via a pin (64); a roller (65) serving as the cam-abutting portion is supported via the pin (64); and an outer flank of that part of the rocker arm (63, 63A, 63B) which opposes a camshaft (31) equipped with the valve operating cam (69) overlaps with an outer flank of the first end of the first link arm (61) as viewed laterally, forming an arc shape around the axis of the pin (64).

[8] The engine valve operating system according to claim 5 or 6, comprising a crank member (68) on opposite ends of a connection plate (68b), where the movable shaft (68a) and a spindle (68c) whose axis is parallel to the movable shaft (68a)

stick out from the crank member (68), wherein the spindle (68c) is turnably supported on the engine body (10).

[9] The engine valve operating system according to claim 1, wherein the link mechanisms (50A, 50B) for the respective rocker arms (63A and 63B) for respective intake valves (19) which are the engine valves have geometries different from each other.

[10] The engine valve operating system according to claim 9, wherein a movable shaft (68a) which supports movable support portions (62Ab, 62Bb) of second link arms (62A, 62B) of the respective link mechanisms (50A, 50B) is installed on a common crank member (68) turnably supported on the engine body (10).

[11] The engine valve operating system according to claim 1, wherein a cam holder (46) with a bearing hole (86) which receives and turnably supports a journal portion (31a) of a camshaft (31) on which the valve operating cam (69) is mounted is installed on the engine body (10); a supply hole (88) whose inner end is communicated with an oil path (87) provided in the camshaft (31) to supply lubricant externally is installed in the journal portion (31a) in such a way as to open an outer end of the supply hole (88) to outer periphery of the journal portion (31a); a receiving groove (89) corresponding to the outer end of the supply hole (88) is provided in at least part of inner periphery of the bearing hole (86); a communicating channel (90) is provided in the cam holder (46), linking an oil jet (91) with the receiving groove (89), where the oil jet (91) is placed in opposing relation to particular parts

out of the engine valve (19), rocker arm (63, 63A, 63B), and link mechanism (50, 50A, 50B); and the location and shape of the receiving groove (89) are determined such that the receiving groove (89) is communicated with the outer end of the supply hole (88) within a particular rotational angle range of the camshaft (31).

[12] The engine valve operating system according to claim 1, wherein an oil sump (98) is installed in an upper part of the fixed support portion (61b) of the first link arm (61) placed above the second link arm (62, 62A, 62B), the oil sump (98) bordering on the outer circumference of a rocker arm shaft (67) which penetrates the fixed support portion (61b) so as to turnably support the fixed support portion (61b); an oil path (99) which allows lubricant to be supplied externally is installed in a cam holder (46) installed on the engine body (10) so as to turnably support a journal portion (31a) of a camshaft (31) on which the valve operating cam (69) is mounted; and an oil supply pipe (100) which drops lubricant into the oil sump (98) from above is installed in a protruding condition so as to be communicated with the oil path (99).